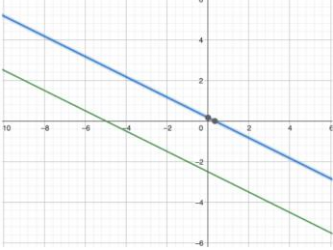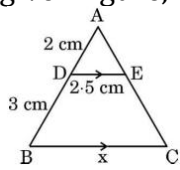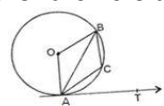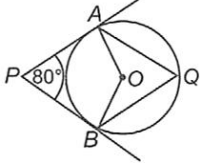# ALL KERALA COMMON MODEL EXAMINATION

MATHEMATICS
CLASS X [2023-24]

Time Allowed : 180 Minutes   **Maximum Marks :** 80
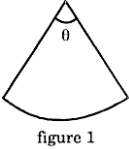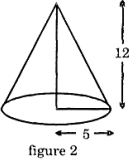
General Instructions:

1. This Question Paper has 5 Sections A, B, C, D and E.

2. Section A has 20 MCQs carrying 1 mark each

3. Section B has 5 questions carrying 02 marks each.

4. Section C has 6 questions carrying 03 marks each.

5. Section D has 4 questions carrying 05 marks each.

6. Section E has 3 case based integrated units of assessment (04 marks each) with sub - parts of the values of 1, 1 and 2 marks each respectively.

7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided. An internal choice has been provided in the 2marks questions of Section E

8. Draw neat figures wherever required. Take$\pi = \frac{22}{7}$ wherever required if not stated.

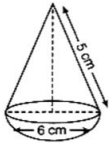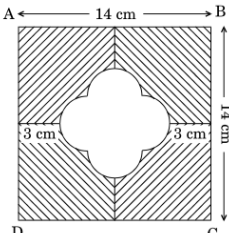|	**Section A**	
1	HCF of $(2^3 \times 3^2 \times 5)$, $(2^2 \times 3^3 \times 5^2)$ and $(2^4 \times 3 \times 5^3 \times 7)$ is a) 60 b) 48 c) 30 d) 105	**[1]**
2	 Find the number of zeroes of p(x) in thegraph given below. a) 3	**[1]**

	b) 0	
	c) 2	
	d) 1	
3	The pair of equations x + 2y + 5 = 0 and −3x − 6y + 1 = 0 have	**[1]**
	a) a unique solution	
	b) infinitely many solutions	
	c) no solution	
	d) exactly two solutions	
4	Which of the following has no real root?	**[1]**
	a) $x^2 - 5x + 3\sqrt{2} = 0$	
	b) $x^2 + 4x - 3\sqrt{2} = 0$	
	c) $x^2 - 4x - 3\sqrt{2} = 0$	
	d) $x^2 - 4x + 3\sqrt{2} = 0$	
5	If the distance between the points (2, - 2) and (- 1, x) is 5, one of the values of x is	**[1]**
	a) - 2	
	b) - 1	
	c) 1	
	d) 2	
6	Which term of the A.P. 121, 117, 113, ... is its first negative term?	**[1]**
	a) 32	
	b) 33	

	c) 30	
	d) 31	
7	The ratio in which (4, 5)divides the join of (2, 3)and (7, 8)is	**[1]**
	a) 2 : 3	
	b) - 3 : 2	
	c) - 2 : 3	
	d) 3 : 2	
8	In the given figure, AD = 2 cm, DB = 3 cm, DE = 2.5 cm and DE || BC. The value	**[1]**
	of x is:	
	a) 7.5 cm	
	b) 3.75 cm	
	c) 6.25 cm	
	d) 6 cm	
9	In figure, AB is a chord of a circle and AT is a tangent at A such that$\angle BAT = 60^o$	**[1]**
	, measure of $\angle ACB$ is :	
	a) 120°	
	b) 150°	
	c) 90°	
	d) 110°	
10	If x = a $\cos\theta$ and y = b $\sin\theta$, then b ^{2} x ^{2} + a ^{2} y ^{2} =	**[1]**
	a) $a^2 + b^2$	
	b) ab	
	c) $a^4 b^4$	
	d) $a^2 b^2$	

11	In the given figure, O is the centre of the circle. If PA and PB are tangents, then the value of∠ AQB is a) 80° b) 60° c) 50° d) 100°	**[1]**
12	If x = a tanθ and y = b sec θ , then a) $\frac{y^2}{b^2} - \frac{x^2}{a^2} = 1$ b) $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ c) $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 0$ d) $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$	**[1]**
13	A pole 6 m high casts a shadow $2\sqrt{3}$ m long on the ground, then the sun's elevation is a) 30° b) 60° c) 45° d) 90°	**[1]**
14	If the area of a sector POK is 100π sq.units and angle POK = 49 ^{o} , then find the radius of sector a) $\frac{60\sqrt{10}}{7}$ units b) $\frac{5\sqrt{10}}{7}$ units c) $\frac{6\sqrt{10}}{9}$ units d) $\frac{9\sqrt{10}}{7}$ units	**[1]**

15	A piece of paper in the shape of a sector of a circle (see figure 1) is rolled up to form a right - circular cone (see figure 2). The value of angle θ is:	**[1]**
	figure 1	
	figure 2	
	a) $\frac{5\pi}{13}$	
	b) $\frac{6\pi}{13}$	
	c) $\frac{10\pi}{13}$	
	d) $\frac{9\pi}{13}$	
16	A bag contains 3 red, 5 black and 7 white balls. A ball is drawn from the bag at random. The probability that the ball drawn is not black, is:	**[1]**
	a) $\frac{5}{10}$	
	b) $\frac{2}{3}$	
	c) $\frac{1}{3}$	
	d) $\frac{9}{15}$	
17	If P(E) denotes the probability of an event E then	**[1]**
	a) $0 \leq P(E) \leq 1$	
	b) $- 1 \leq P(E) \leq 1$	
	c) $P(E) < 0$	
	d) $P(E) > 0$	
18	The median of first 8 prime numbers is	**[1]**
	a) 9	
	b) 11	

	c) 13	
	d) 7	
19	**Assertion (A):** The given figure represents a hemisphere surmounted by a conical block of wood. The diameter of their bases is 6 cm each and the slant height of the cone is 5 cm. The volume of the solid is 196cm ^{3} **Reason (R):** The volume hemisphere is given by $\frac{2}{3}\pi r^3$ a) Both A and R are true and R is the correct explanation of A. b) Both A and R are true but R is not the correct explanation of A. c) A is true but R is false. d) A is false but R is true.	**[1]**
20	**Assertion (A):** Common difference of the AP - 5, - 1, 3, 7, ... is 4. **Reason (R):** Common difference of the AP a, a + d, a + 2d, ... is given by d = 2nd term - 1st term. a) Both A and R are true and R is the correct explanation of A. b) Both A and R are true but R is not the correct explanation of A. c) A is true but R is false. d) A is false but R is true.	**[1]**
	Section B	
21	Show that $3 + \sqrt{2}$ is an irrational number.	**[2]**
22	Prove that a line draw through the mid point of one side of a triangle parallel to another side bisects the third side.	**[2]**
23	In figure 2, find the area of the shaded region, where ABCD is a square of side 14 cm in which four semi - circles of same radii are drawn as shown	**[2]**
24	Find the value of x if $\cos2x = \cos60°\cos30° + \sin60°\sin30°$	**[2]**

	OR	
	Prove that $\frac{1+\tan^2 A}{1+\cot^2 A} = \sec^2 A - 1$	
25	A car has two wipers which do not overlap. Each wiper has a blade of length 25cm sweeping through an angle of 115°. Find the total area cleaned at each sweep of the blades. **OR** What is the angle subtended at the centre of a circle of radius 6 cm by an arc of length 3π cm?	[2]
	Section C	
26	In the Hospital The nurse is supposed to monitor a patient after84min another at 90 min and the thirdone at 120 min. For this, she set up alarms accordingly. At what time will all her alarms ring at the same time?	[3]
27	Write the family of quadratic polynomials having$-\frac{1}{4}$ and 1 as its zeros.	[3]
28	Solve the system of equations graphically:3x - 4y =7 5x + 2y =3 Shade the region between the lines and the y - axis **OR** The ratio of incomes of two persons is 9 : 7 and the ratio of their expenditures is 4 : 3. If each of them manages to save₹ 2000 per month, then find their monthly incomes.	[3]
29	Prove that the tangent drawn at the midpoint of an arc of a circle is parallel to the chord joining the end points of the arc. **OR** Prove that the tangents drawn at the ends of a chord of a circle make equal angles with chord.	[3]
30	If $\sin\theta = \frac{12}{13}$, find the value of $\frac{\sin^2\theta - \cos^2\theta}{2\sin\theta\cos\theta} \times \frac{1}{\tan^2\theta}$.	[3]
31	A class teacher has the following absentee record of 40 students of a class for the whole term. Find the mean number of days a student was absent	[3]

Number of Days	0-6	6-12	12-18	18-24	24-30	30-36	36-42
Number of students	10	11	7	4	4	3	1

	Section D	

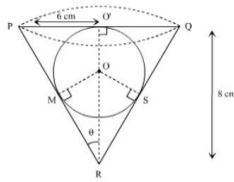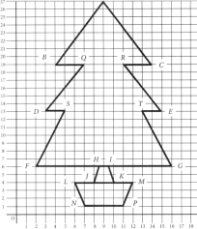| 32	A cottage industry produces a certain number of toys in a day. The cost of production of each toy (in rupees) was found to be 55 minus the number of toys produced in a day. On a particular day, the total cost of production was₹ 750. We would like to find out the number of toys produced on that day. Represent the situations mathematically (quadratic equation). **OR** Solve thequadratic equation by factorization:$\frac{3}{x+1} - \frac{1}{2} = \frac{2}{3x-1}, x \neq -1, \frac{1}{3}$	**[5]**
33	In trapezium ABCD,$AB \parallel DC$ and DC = 2AB. EF drawn parallel to AB cuts AD in F and BC in E such that $\frac{BE}{EC} = \frac{3}{4}$. Diagonal DB intersects EF at G. Prove that 7 FE = 10 AB.	**[5]**
34	A conical vessel of radius 6 cm and height 8 cm is completely filled with water. A sphere is lowered into the water and its size is such that when it touches the sides, it is just immersed as shown in Figure. What fraction of water over flows? **OR** A toy is in the form of a cone mounted on a hemisphere. The diameter of the base of the cone is 7 cm and its height is 15.5 cm. Find the volume of the toy. (Useπ = 3.14).	**[5]**
35	250 apples of a box were weighed and the distribution of masses of the apples is given in the following table: | Mass (in grams)	80 - 100	100 - 120	120 - 140	140 - 160	160 - 180
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Number of apples	20	60	70	x	60 | 1. Find the value of x and the mean mass of the apples. 2. Find the modal mass of the apples.	**[5]**
	Section E	
36	**Read the text carefully and answer the questions:** Your elder brother wants to buy a car and plans to take loan from a bank for his car. He repays his total loan of₹ 1,18,000 by paying every month starting with the first instalment of ₹	**[4]**

1000. If he increases the instalment by ₹ 100 every month , answer the

following:

1. Find the amount paid by him in 30th installment.

2. Find the amount paid by him in 30 installments.

   OR

3. Find the 10th installment, if the 1st installment is of ₹ 2000.

4. If total installments are 40 then amount paid in the last installment?

37	**Read the text carefully and answer the questions:** The design of Christmas tree is shown in the following graph: 1. What is the distance of point A from x - axis? 2. What is the Length of BC? **OR** 3. What is the perimeter of its trunk LMPN? 4. What is the Length of FG?	**[4]**
38	**Read the text carefully and answer the questions:** An observer on the top of a 40m tall light house (including height of the observer) observes a ship at an angle of depression 30° coming towards the base of the light house along straight line joining the ship and the base of the light house. The angle of depression of ship changes to 45 ^{o} after 6 seconds. 	**[4]**

1. Find the distance of ship from the base of the light house after 6seconds from the initial position when angle of depression is 45 ^{o}

   .

2. Find the distance between two positions of ship after 6 seconds?

   OR

3. Find the distance of ship from the base of the light house when angle of depression is 30° .

4. Find the speed of the ship?